

Light Formations

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“Light Formations” is a group of student-created art installations, that explore the material, organizational and perceptual dimensions of light. Completed in 2016 for a course called “Light, Color and Space” at Stanford University, these projects engage light as both photon units and generators of atmosphere. They aim to reveal this invisible matter through a range of material and spatial tactics. In so doing, these pieces harness light as a primary material, affording visual and experiential access to the light that surrounds us. These installations draw upon a legacy of light studies initiated by artists throughout the last century. Although light has been a subject of artistic concern for millennia, the approach of isolating light as a malleable artistic medium is a decidedly modern practice. This paper will track its evolution from an exhibition and stage set element, to a medium for visual resonance, and a channel for introspection and self-knowledge.

PART I: PLAYING LIGHT

The emergence of light art might be traced to Thomas Wilfred, a Danish artist who immigrated to the United States in 1916 to pursue a new type of projective light art he named “Lumia”. The son of a photographer, Wilfred conducted studies by projecting light through colored glass and prisms. He eventually grew these experiments into larger pieces and stage sets. He embraced the use of light as a material, stating, “Light is the artist’s sole medium of expression. He must mold it by optical means, almost as sculptor models clay.”¹ In this pursuit, Wilfred developed a playable light organ with sliding keys which would control the form and intensity of projected light. Dubbed the Clavilux, this kinetic light mechanism featured an elaborate assembly of elliptically shaped reflectors, tinted film, metal and glass screens, which would project multicolored light compositions onto surrounding screens, walls or ceilings.

Regarding traditional oil and brush painting as a static art, Wilfred perceived light painting as the more dynamic medium because it

incorporated time. ²Probably influenced by Einstein’s recent theories of space-time and the fourth dimension, Wilfred arranged the light compositions in cycles, the duration of which ranged from a quick 5 minutes to a protracted 6 years. These were always projected onto a flat screen and were viewed by audiences in a theatre-like format.

Wilfred’s earliest Clavilux pieces debuted in 1922 and were received eagerly by American audiences as well as the press, who were enthusiastic about the potentials of this new art form. The shows mesmerized viewers with ethereal, cloudlike compositions that elicited references to aurora borealis, the heavens, and infinite space. Although Wilfred discussed the Lumia pieces as conveyors of universal powers and truth, he also allowed the compositions to be backdrops for other types of performances, such as symphony and dance. In 1930, he created scenery for the Broadway production of Ibsen’s “The Vikings” and later played the Clavilux alongside The Philadelphia Orchestra. Although he did pioneer the art of stage projection, Wilfred’s willingness to share the stage with other arts perhaps diluted the primacy of light in the overall experience and allowed it to fall into the background.

Lazlo Moholy-Nagy, an admirer of Wilfred, experimented with light techniques during his years at the Bauhaus. Beginning in the 20’s, he recorded light through direct-exposure photography in a series of photograms that he continued to develop for decades. In these art works, Moholy-Nagy used everyday objects placed directly on light sensitive paper, and played with varying intensities of light exposure. By displacing objects and recording the movement through multiple exposures, Moholy Nagy was able to suggest movement and depth. These experiments rendered a plasticity to light through varying angles and superimpositions of forms upon the photo paper. Controlling the nuances of direct contact and projected exposures, his compositions suggested the spatial potentials of light, and set a groundwork for his three dimensional investigations.

At around the same time that Wilfred developed the Clavilux, Moholy-Nagy began planning his “Light Prop for an Electric Stage” in preparation for the 1930 Deutscher Werkbund Exhibition in Paris. This piece featured an assembly of perforated metal, mesh and plastic discs set upon a metal frame and rotating base. It was powered by an electric motor and system of gears, and operated

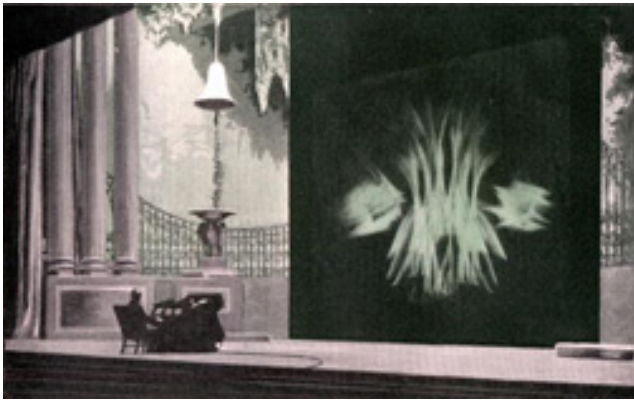


Figure 1: Thomas Wilfried, *Clavilux Performance*

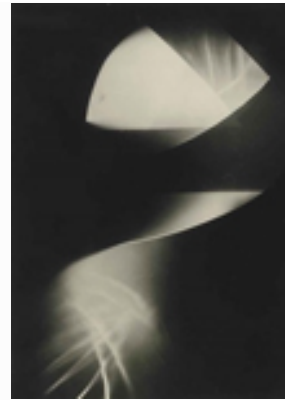


Figure 2: Lazlo Moholy Nagy, *Photogram, Untitled*.

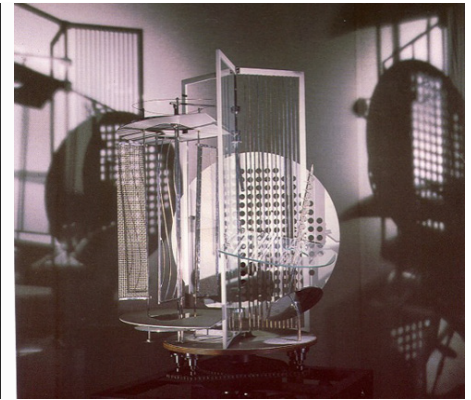


Figure 3: Lazlo Moholy Nagy, *Light Prop for an Electric Stage photogram*.

by a simple on/off switch. Rather than being played like an instrument, light was projected upon and through the spinning sculpture, which cast imposing lattices and forms around the space. Smaller elements within the piece rotated upon their own axes, directing a stream of light and shadows upon the adjacent walls. Through reflection and filtering, the resultant film-like projections produced a dynamic, if not dizzying, display of superimposed fleeting, anamorphic geometries.

In “The New Vision and Abstract of an Artist”, Moholy-Nagy claimed, “I became interested in painting with light, not only on the surface of canvas, but directly onto space.”³ In contrast to the mystical, sinewy forms generated by Wilfred’s projection boxes, *Light Prop* explored a more architectonic dimension of light and shadow as spatial media. Although the piece was not intended to produce habitable space, the effects did animate a new model of spatial production. Regarding the projection device more as a tool for creating light and space than as an art piece, Moholy-Nagy altered and repaired the piece repeatedly through the years, even as it endured several relocations and mechanical issues.⁴ The physical machine, also called “Light-Space Modulator”, played just a mediating role between the viewer and the ephemeral compositions it produced. The piece, with its stiffly functional name, demonstrated the effects of a light mechanism, as devised with technicians and engineers.

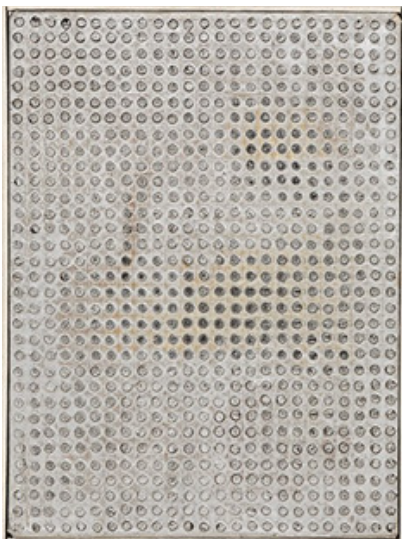
Some of these techniques were further developed and refined by Gyorgy Kepes, one of Moholy-Nagy’s colleagues from the Bauhaus who eventually founded the New Bauhaus and MIT’s Center for Advanced Visual Studies. Fusing an interdisciplinary approach between the arts and the science-based culture of MIT, Kepes regarded both disciplines as ordering and “image-making” devices, with nature and environmental systems as the common ground.⁵ Working primarily in experimental photography through direct exposure photograms, Kepes explored the visual complexities of light, shadow, and transparency. Through more refined techniques of superimposition and multiple exposures, he achieved rich texture and depth within the plane of the photo paper, producing

complex compositions that suggested the passage of time through space. Kepes was equally interested in the visual perception of his compositions by the viewer. Indeed, his formulation of the term “Phenomenal Transparency” in *Language of Vision*, gave rise to Rowe and Slutzky’s elaboration and dissemination of his concept. Terms such as oscillation, simultaneity, and multiplicity entered the vocabulary of visual effects.

PART II: VIBRATIONAL FIELDS

The late 40’s and 50’s can be viewed as an incubation period during which new artistic sensibilities emerged from the carnage and destruction of World War II. In the 50’s, avant-garde groups such as the Gutai movement of post-War Japan and Group Zero in Germany, rejected representational practices in favor of interactive experiences. These tendencies also included a penchant towards Minimalism. In particular, Group Zero worked to remove the hand of the artist, stripping art down to its bare materials while articulating a new set of practices “that should serve as ground zero and starting-point for a fresh awareness of our surroundings”.⁶ They embraced the ideal of “pure light”, seeing its potential as a new universal medium.

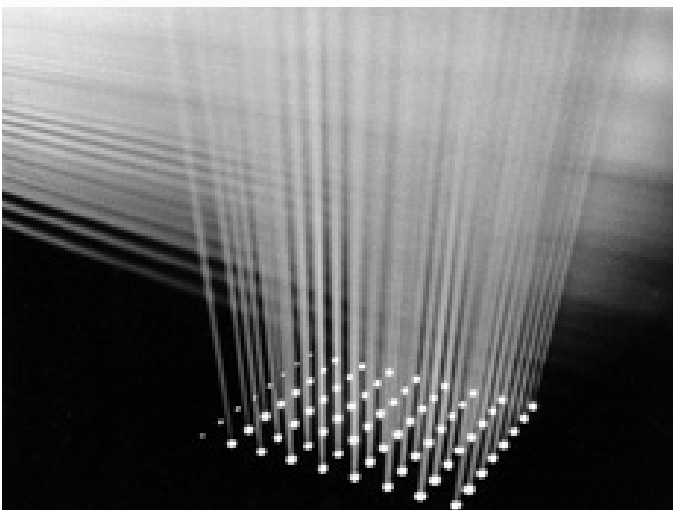
Many Zero artists explored light through the theme of vibration, meshing it with themes of the immaterial and poetic. They dedicated the second issue of their eponymous publication to this phenomenon. The merging of art and technology are evident in Group Zero founder Otto Piene’s series of Stencil Paintings from the 1950’s. Piene created these paintings by building up layers of thick paint through hand-punched cardboard stencils. He created a relief of monochrome points across the canvas, each mound capturing light differently in an oscillating field. The projecting mounds are arranged in a grid that both organizes and activates the space of the canvas while producing visual pulsations across the field. Rendering some of the effects of Phenomenal Transparency, Piene applied the notion of vibration to describe the fluid interaction between viewer and artwork, alluding to the psychological potential of light. Of this, he identified the “continuous flow of rhythmic current between painting and observer”.⁷ These sentiments foreshadowed a shift to the consciousness-inducing capacities of light, explored in the following decades by artists such as Robert Irwin and James Turrell.



The Stencil Paintings led to experiments in which Piene projected light through stencils onto walls, eventually scaling up to room-sized light projections set to music in the late 50's. Known as Light Ballets, light was projected from mechanized lamps housed within stenciled boxes, onto the walls of the surrounding room. More immersive and participatory than Moholy-Nagy's "Space Time Modulator", these arrangements feature multiple light sources within a single space. Matrices of light were projected upon a wall from several suspended strobe-like orbs, creating rotating, swirling and dimensional compositions of light across all surface of the room. The viewer was invited to be an interactive player in the projections, giving her some authorship in the composition and realization of the piece. This expanded role of the viewer revealed a desire to create connections through technology. In its emphasis on motion, perception, and time, it also anticipated aspects of the Land Art Movement.



The influence of Piene's stencil Paintings can be seen in some of Kepes's later work. Although most of Kepes's art work was completed on paper, his 1964 simulation of the lighting for a mile-long luminous wall at the Boston Harbor Bicentennial forged a novel spatial system for light. It featured a grid of pinholes on a surface, through which strands of light are projected. These fibers of light were superimposed upon another, opposing field of beams that are projected from the perpendicular direction. Here, light was woven in into a 3-dimensional matrix, producing a subtly textured light object in space. The light source was hidden and the materiality of the perforated surface obscured in shadow, foregrounding the materiality and complexity of the light itself. This marked an important break from light art that focused on the reflected surface of the canvas or a screen. Although this project was not realized, Kepes's simulation marked a move to spatialize pure light, releasing it from the flatness of the paper into a densely woven organizational system.



Piene eventually joined the MIT faculty in the late sixties, and took over Kepes's post as the director of the Center for Visual Studies in 1974. Similar to Kepes, Piene sought collaboration with his peers at MIT, creating lasting partnerships with his colleagues. His collaborations centered around his work with electrical engineers and physicists. In an interview with *Art in America* in 2010, he explained, "At MIT, we believed technology wasn't only a war medium, but could be used for healing, and to expand communication as a human means."⁸ His use of light to improve the human condition expressed an optimism about the redemptive potential of technology, when used with discretion.

PART III: LIGHT WITHIN

While the artists at MIT aspired to increase connection and interaction through technology, artists on the West Coast engaged technology through material means, incorporating post War materials into their work. Influenced by products developed for the burgeoning aerospace industry, artists began to incorporate resin, fiberglass, and tinted glass into light art.⁹ Of the California Light and Space artists, James Turrell is notable for concealing the props and tools required to create his light installations. His pieces tend

Figure 4: Otto Piene, Stencil Painting "Frequency", 1957

Figure 5: Otto Piene, Light Ballet, 1969

Figure 6: Gyorgy Kepes, Simulation for the Boston Harbor Bicentennial, 1965



Figure 7: Anthony Mc Call, “Line Describing a Cone”, 1973
 Figure 8: Olafur Eliasson, “Yellow Fog”, 2008.

to reduce light to its most minimal presence, in order to heighten the relationship with the viewer. In the 60’s, he created the Afrum series, projecting light into the corners of rooms, producing a perceptual game with a cube that would fluidly project or recede, depending on your spatial or visual relationship to the box.

These early experiments eventually evolved into large scale explorations, such as the 1970’s Wedgework series, as Turrell migrated from object-related pieces to larger scale immersive environment that occupied entire rooms or buildings. In later pieces, the light source is concealed behind the screen or tucked into a channel around the perimeter, leaving the viewer to contend with just the phenomenon and perception of light. Visually, there is a lack of definitive location to the surfaces of the Wedgework series, and one experiences a

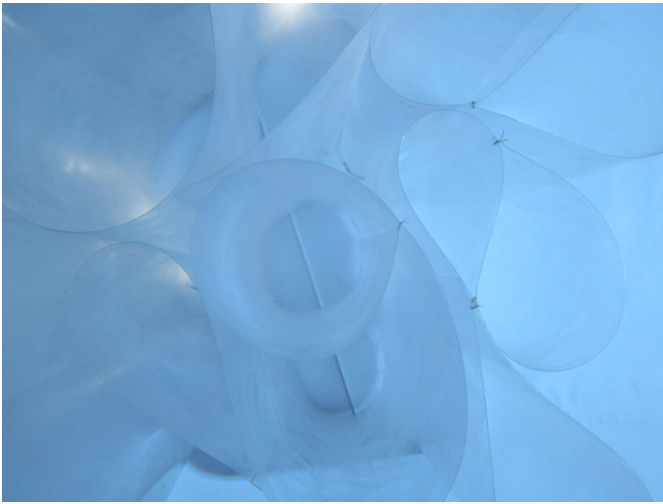
perceptual fluctuation between foreground and background, evoking Kepes’s “Phenomenal Transparency”. However, Turrell reaches beyond the formal visual vicissitudes of his work, embracing the spiritual, perceptual dimensions of light. He approaches the encounter with light as an opportunity for the viewer to unite the soul and the conscious and unconscious mind.

Turrell’s whole-room ganzfeld (whole-field) installations push the materialization of light to an extreme, where the light seemingly subsumes the walls of the gallery. His Ganzfeld pieces present a more stripped-down experience, blocking out most senses and reducing the encounter to just the viewer and the light itself. The presence and materiality of the PVC scrim screen is also diminished, resulting in zones of light with ambiguous locations, based on subtle variations of the light values as they interact with the viewer’s eye. In an interview with Elaine King for *Sculpture* magazine, he stated that, “The art that I make covers this ground between form and actually forming space using light... This quality of working the space in between so that it limits or expands the penetration of vision is something that intensely fascinates me.”¹⁰ His comfort with this liminal material state mirrors his goal of using light as a means to reach an elevated spiritual state. In keeping with the Quaker view that through meditation, you find your inner light, Turrell describes quietude and introspection as integral parts of the experience.

PART IV: MANIFESTING ATMOSPHERE

Embracing the technology of film projection, Anthony McCall’s work uses projected light to produce a type of three dimensional drawing, and is one of the first uses of smoke to materialize light within the medium of air. For example, in his 1973 “Line Describing a Cone” a single beam of light is projected into a dark, haze-filled room, as the viewer witnesses the slow clockwise growth of the linear beam into the surface of a cone. This was the first of Mc Call’s “Solid Light” films, and were shot on 16mm film. McCall stated that “... it deals with the projected light beam itself, rather than treating the light beam as a mere carrier of coded information, which is decoded when it strikes a flat surface ... This film exists only in the present: the moment of projection. It refers to nothing beyond this real time. It contains no illusion. It is a primary experience, not secondary: i.e., the space is real, not referential; the time is real, not referential.”¹¹ These projections rely on the creation of a light-absorbing atmosphere, created by haze machines that emit corn starch. Unlike the projected light installations by Wilfred or Moholy-Nagy, Mc Call thickened space to establish a visible travel medium for light. He insists on the direct, or primal experience between the viewer and the artwork, as an essential element of his pieces.

The creation of atmosphere marked a shift to the production of thickened air in the mediation of light. Rather than relying on the contrast between darkness and projected light, the air itself is treated as one of the material elements. The influence of McCall can be seen in some of Olafur Eliasson’s work. A smoke similar to McCall’s is explored outdoors in his 2008 “Yellow Fog” urban light installation in Vienna.³² hidden lamps with yellow bulbs are



Figures 9 and 10: "Ephemeral Viscosity", Junha Hwang, Royce Wang, and Courtney Urbancik

Figures 11 and 12: "Light Points", Lissette Valenzuela

Figures 13 and 14: "Phenomenal Landscape", Veronica Stamats

concealed under sidewalk grates, and illuminate timed bursts of fog along a 150' foot long building façade, eventually dissipating into the surrounding air. Bringing light out of the gallery, and onto city streets, this piece treats light as a dissipating, ephemeral element

Examining the work and evolution of past and contemporary artists provided a framework through which we could explore the material, organizational, perceptual and performative dimensions of this small sliver of the electromagnetic field. The web of relationships and influences between the discussed artists reveal the evolving use of light, in the context of history, technology, visual phenomenon and psychology. Broadly, one can track the gradual reduction of exposed elements in favor of manifesting light through the most minimal of means. From Kepes to Eliasson, one can also see the focus shift from the object itself, to the heightened encounter between the viewer and the light.

PART V: THICK SPACE STUDIES

For the course taught at Stanford, the assignment asked students to explore the idea of “Thick Space”, using material and immaterial methods to redefine a space. This undergraduate course included majors and non-majors, and students worked in teams and individually for the three-week assignment.

One project, “Ephemeral Viscosity” generates an undulating landscape of light and shade, a nod to the ever-changing fog of the Bay Area. Placed in a dark room, curved loops of sanded and hand-stitched polycarbonate sheets, coupled with LED lights, are aggregated to create a diaphanous landscape across a plane.

In the course, we discuss the interactions of photons, which are micron-scale packets of light energy, with physical materials. The atomic arrangement of materials dictates electron arrangement, which in turn dictates the energy levels of the electrons. This configuration of atoms determines the visual properties of a material, such as its color, polarization and level of transparency. In transparent and translucent materials, photons cannot “charge” the electrons of the atoms to a higher energy state, and thus pass through. In opaque materials, the photons do move the atoms to a higher energy state, and are therefore absorbed. It then follows, that in translucent materials, only some of the photons succeed in moving the electrons to the next energy level, producing a semi transparent quality to the surface.

For this project, students examined the light transmission through clear polycarbonate sheets, and then explored different sanding techniques to balance the shadow and light in the dark room. They layers of illuminated surfaces produced shadows across the floor.

Another installation, “Light Points”, inserts a three-dimensional field of light “particles” within existing spaces, initiating a new spatial order. Small squares of fabric capture light as points, articulating light as a ubiquitous substance of space. Eroding the binary designation between solid and void space, this installation renders space as a thickened medium organized by a delicately placed matrix. Users must navigate the dense space, resulting in a slowness of time as

one perceives the new organizational structure. Placed within a stair within a campus building, the installation suggests a way to materialize light into the fabric of everyday space.

“Phenomenal Landscape”, the third installation, is located in a clearing between Lake Lagunita and a wooded perimeter path. Marking this gateway through a series of suspended mesh “screens” organized in layers, the installation animates the process of crossing the boundary by registering the light conditions of the passage at each plane. The series of fabric fields articulate light “cuts” through the site like a series of sectional drawings, receiving light but also projected shadows from the tree canopy above. In order to reach the lake, users must traverse this field of light planes, delaying the arrival while their attention turns to the plays of light and shadow projected onto the screens.

These mesh screens captured photons that just made the 93 million mile journey from the sun, animating elements that were indeed remote just 8.5 minutes prior. Through the transmission and refraction of light waves, they absorb and slow the movement of photons through these slight material interventions.

PART VI: LIGHT AS MATERIAL PRACTICE

Light’s instrumentality as a spatial, organizational and perceptual medium could be more fully realized if we integrated it within the material practice of design. Collectively, these student projects speculate about such strategies. By materializing light, the projects harness what we cannot see and suggest an expanded role of light in design practice. These projects cross between the material/immaterial, solid/void, art/architecture, and shadow/light, as they broaden our normative boundaries of perception. By changing our normative attitudes toward light and lighting, perhaps these potentials can extend beyond the confines of a theatre or gallery, and into the everyday spaces we inhabit.

ENDNOTES

- 1 Orgeman, Keely. *Thomas Wilfried and the Art of Light*, (Yale University Press, 2017), 27.
- 2 Ibid., 34.
- 3 Moholy-Nagy, Lazlo. *The New Vision and Abstract of an Artist* (New York: Wittenborn Schultz, Inc., 2005.)
- 4 Gerwertz, Ken. “Light Prop Shines Again”, *Harvard Gazette*, July 19, 2007.
- 5 Kepes, Gyorgy. “Language of Vision”, *Literary Licensing*, 2012.
- 6 Hillings, Valerie and Derom, Edouard. *ZERO: Countdown to Tomorrow, 1950s-60s* (Guggenheim Museum Publications, 2014.)
- 7 Piene, Otto, *Über die Reinheit des Lichts*, *ZERO 2* (Oct. 1958), 24–27, reprinted and translated as “On the Purity of Light” in *ZERO* (1973), 47.
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- 9 Hanor, Stephanie. “The Materiality of Immateriality,” In *Phenomenal California Light Space and Surface*, ed. Robin Clark (University of California Press, 2012.)
- 10 King, Elaine. “Into the Light: A Conversation with James Turrell”, *Sculpture Magazine*, November 2002.
- 11 McCall, Anthony and Godfrey, Mark. “Anthony McCall’s Line Describing a Cone”, *Tate Papers* No. 8, Autumn 2007.